Chapter Three
Waste Prevention Strategies

Overview

Although the current solid waste problem is depicted principally as a waste disposal problem it is also a waste generation problem. The United States is generating more waste now than ever before. From 1960 to 1990, total U.S. MSW generation increased 123 percent, from 87.8 million tons to 195.7 million tons per year, while per capita generation increased nearly 59 percent, from 2.7 to 4.3 pounds per person per day. At current levels, the amount of waste generated is expected to reach 222 million tons in 2000, or 4.5 pounds per person per day.[1]

At the root of this problem are the types and amount of products and materials we use and discard. Single-use products, which are designed to be thrown away after one use, constitute a substantial portion of total MSW. In 1990, 33 percent by weight of all municipal solid waste consisted of packaging and containers, and an additional 27 percent consisted of nondurable products, including paper products, plates, cups, books, magazines, and clothing?

Preventing waste generation saves money in waste hauling, disposal, and recycling fees; conserves valuable landfill space; and reduces energy and resource use.

EPA considers source reduction—the reduction of the volume and toxicity of waste-as the preferred waste management strategy. Preventing waste generation saves money in waste hauling, disposal, and recycling fees; conserves valuable landfill space; and reduces energy and resource use. While recycling diverts waste from disposal, source reduction eliminates the amount of material entering the waste stream.

This chapter describes and, where information is available, evaluates the strategies that have been implemented by communities in our study to reduce waste generation. (Table 3.1 lists per capita waste generation rates and the source reduction programs of the 30 communities.)

To date, the success of these programs has been difficult to measure. Few communities conduct annual waste generation studies.[3] The quantification of waste reduction is also difficult because total and per capita waste generation or composition rates are on the rise. Waste reduction should be considered in terms of reduction below future rates as well as below existing rates. In addition, certain source reduction programs, particularly education programs, may not lead to changes in individual purchasing and waste generation behavior until a few years after initiation. It takes time for residents to develop new purchasing practices, and manufacturers time to redesign products. States and communities would benefit by expanding the type of source reduction programs offered as well as by improving their methods of quantifying such achievements.

Few communities have established comprehensive source reduction programs, partly because source reduction is more difficult to measure than waste diversion through recycling and composting. States' waste reduction goals, which frequently determine local goals, rarely include measurement of source reduction. In many instances, communities do not receive credit toward their state waste diversion goal for implementing source reduction programs. In addition, communities frequently lack control over decisions regarding product design and manufacture, and have little guidance on how to bring about changes in the waste stream.

Nevertheless, communities can play an active role in diverting materials from disposal and reducing waste generation rates. A few communities, such as Berkeley, California, have set source reduction goals, and a number have implemented programs to reduce waste, which include:

- educating citizens about source reduction, emphasizing change in purchasing practices and product reuse;
- implementing a backyard composting program;
- establishing or encouraging the establishment of salvage and reuse operations;
- implementing volume-based refuse collection fees; and
- regulating packaging or other materials sold and/or used within their jurisdiction.

What actually constitutes source reduction is not well defined. True waste prevention literally means that we do not generate waste. This involves using reusable and durable rather than disposable products, and using less resources per product at the manufacturing level. Little has actually been done to avoid generation of waste on a community wide level, although individual businesses have undertaken successful efforts. While salvage/reuse operations and. backyard composting are often considered forms of source reduction, these strategies do not actually prevent the generation of discards. We include backyard composting as source reduction because organic materials composted in backyards never enter the municipal waste stream. We also include examples of salvage/reuse operations because, by extending the useful life of products, they may result in the use of fewer total products, thus indirectly preventing waste generation.

Source Reduction Education

Local communities are implementing source reduction education programs to teach citizens about general solid waste issues, as well as specific changes in their purchasing and disposal practices. Communities are also supporting local organizations that promote source reduction concepts. Source reduction education can target children through in-school curricula, consumers through supermarket shelf labeling and informational brochures, and businesses through waste audits and other technical assistance. A number of communities, most notably Berkeley and Sonoma County, California; Newark, New Jersey; Boulder, Colorado; and Monroe, Wisconsin, have implemented such education programs. Source reduction and environmental shopping programs have been well received by citizens, and some manufacturing and retail companies are responding to consumer demand for "environmentally preferable" products. (See side bar "The Environmental Consumer Movement.")

In 1989 the City of Berkeley implemented a large-scale campaign, known as "precycling," to urge consumers to prevent the generation of waste through environmentally minded purchasing. The Berkeley precycling program encourages residents to purchase products packaged in recyclable materials, avoid purchase of disposable products and products in multiple layers of packaging, and buy in bulk. Residents are also encouraged to reuse and repair products. Drawing on information provided by local environmental and recycling groups, the Berkeley Department of Public Works promotes the precycling concept through fliers and newspaper advertisements. The City also encourages local merchants to offer discounts to customers who bring their own containers, and use reusable napkins and silverware.

Other communities, such as Newark and Boulder, have initiated precycling campaigns modeled after Berkeley's program. Based on responses from 2,000 shoppers, Boulder's precycling campaign successfully increased consumer awareness about ways to reduce waste generation. Of the shoppers surveyed, 84 percent claimed they were familiar with the program, 54 percent could identify precycle concepts, and 74 percent said the campaign helped them reduce waste.

Information disclosure at the point of purchase, including shelf and product labeling, encourages consumers to select products that advance source reduction and recycling goals. Some states, such as Rhode Island and New York, have implemented labeling programs to identify and promote products that are reusable, recyclable, and/or made from secondary materials. In one "Model"

Table 3.1
Waste Generation Rates and Source Reduction Programs

Community	Type	Population	Per Capita Residential Waste Generation (lbs/day) (a)	Per Capita MSW Waste Generation (lbs/day)	Household Residential Waste Generation (lbs/day) (e)	Source Reduction Program (b)
Austin, TX	U	465,622	3.0	NA	7.0	Sa/R (c)
Berkeley, CA	U	102,724	NA	5.5	NA	B,P,Sa/R,V (d)
Berlin Township, NJ	S	5,620	5.9	7.7	18.4	None
Boulder, CO	S	88,000	1.8	3.9	4.6	E,P
Bowdoinham, ME	R	2,189	1.5	1.5	3.8	Sa/R,V
Columbia, MO	S	69,101	2.4	NA	6.6	None
Dakota County, MN	S/R	274,016	2.3	4.6	6.2	V
Fennimore, WI	R	2,378	1.5	2.9	3.7	BY (e)
King County, WA	S/R	991,060	4.4	7.6	11.5	BY,V
La Crescent, MN	R	4,305	1.4	2.3	3.9	Sa/R,V
Lafayette, LA	S	90,000	2.1	4.5	6.4	None
Lincoln, NE	U	191,972	3.9	7.1	10.0	E
Lincoln Park, NJ	S	10,978	3.9	6.3	9.4	None
Mecklenburg Co, NC	U/R	511,433	3.1	7.7	7.4	None
Monroe, WI	R	10,220	2.2	6.8	5.3	E,BY
Naperville, IL	S	85,351	3.2	NA	8.7	BY
Newark, NJ	U	275,221	NA	NA	NA	B,E,P,Sa/R
Perkasie, PA	S	7,878	2.4	NA	4.9	V
Peterborough, NH	R	5,239	2.1	5.2	6.1	None
Philadelphia, PA	U	1,633,826	3.7	6.9	8.9	Sa/R (f)
Portland, OR	U	440,000	NA	7.6	NA	B,V
Providence, RI	U	160,728	3.0	5.3 (g)	7.8	E
San Francisco, CA	U	723,959	2.3	5.4	5.1	E,P,V
Seattle, WA	U	516,259	3.2	7.8	6.7	BY,E,Sa/R,V
Sonoma County, CA	R	388,222	1.8	6.6	4.3	B,E,Sa/R,V
Takoma Park, MD	S	16,900	3.8	NA	9.2	None
Upper Township, NJ	R	10,861	NA	NA	NA	None
Wapakoneta, OH	R	9,214	NA	5.5	NA	V
West Linn, OR	S	16,557	2.1	2.6	5.7	BY,V
West Palm Beach, FL	S	62,530	6.1	10.6	15.6	None

Key:

B = Material/Product Ban
NA = Not Available
Sa/R = Salvage/Reuse Programs
V = Volume-based Refuse Rates
BY = Backyard Composting
P = Precycling or Environmental Shopping
S = Suburban or Small City
-- Not Applicable
E = Extensive Source Reduction Education
R = Rural
U = Urban

Notes:

(a) Per capita and per household waste generation figures were calculated for that portion of the population for which waste generation data were available. In the communities of Naperville, IL; Perkasie, PA; Philadelphia, PA; Providence, RI; and Takoma Park, MD, per capita waste generation was calculated based on the tons of waste generated in the refuse collection district divided by the estimated number of residents in the same district. Per capita and per household residential waste rates may underrepresent actual generation levels in some instances. For example, in some cases such as San Francisco and West Linn they exclude self-haul and bottle bill tonnages. In King County and Seattle, per capita and per household waste generation figures include residential self-haul tonnages. For some cities ILSR calculated the average number of people per household to arrive at a per capita figure. See Appendix C for community-specific descriptions of residential waste calculations. Tonnages composted in residents' backyards are excluded for all cities except San Francisco. Tonnages collected through salvage/reuse operations are included in above figures where available.

(b) While a number of cities provide source reduction educational materials in schools and/or to residents, only cities with extensive programs are listed. Only comprehensive salvage reuse operations are listed; thrift shops and second-hand stores, common in most communities, are excluded.

(c) In 1992 Austin will implement variable-based refuse rates.

(d) In 1991 Berkeley instituted a backyard composting program.

(e) Fennimore requires residents to purchase refuse bags for $0.07 per bag, however because this fee is so low, we do not consider it a volume-based refuse rate.

(f) In 1991 Philadelphia funded a master backyard composting program.

(g) Since the residential waste generated by households in buildings with more than six units is untracked, this per capita MSW waste generation figure is estimated by adding commercial/institutional waste generated per capita to the 3 lbs. per capita generated by residents in buildings with six or fewer units.

Supermarket established by the Central States Education Center (CSEC), a nonprofit organization located in Champaign, Illinois, hot pink labels on designated shelves identify products with the least packaging, products that are packaged in recyclable containers, and products that contain no toxic properties ("safer earth").[4]

Research from Europe, where national environmental labeling programs are well-established, indicates that residents are aware of the presence of environmental labels and that these labels have increased up to 40 percent the sale of identified products. Manufacturers are extremely interested in being awarded such labels.[5]

While there is some evidence that environmental shopping and labeling programs have increased consumers' awareness about waste reduction issues, and that manufacturers are responding to consumer demand, there is as yet no proof that, such programs have changed communities' waste generation rates. Berkeley, for example, has not tracked its waste generation rates or waste composition since 1989, and thus cannot accurately determine how its precycling program has changed the composition or volume of the waste stream.

There is evidence, however, that source reduction programs have changed waste generation rates at the institutional or business level. In the CSEC's Model Schools, for instance, students are encouraged to minimize the amount of packaging in their lunch boxes. One Illinois school reports that average lunchroom garbage decreased by one-third, from 60 to 40 pounds per day. Many children now bring their lunch in reusable rather than disposable containers.[6]

Monroe, Wisconsin is actively encouraging local businesses and institutions to reduce waste generation. Through educational outreach alone, the Monroe Area Recycling Committee convinced area schools to switch from disposable to reusable trays. One elementary school estimates that this switch has reduced by 75 percent the volume of trash generated on an average day. (See side bar, "Waste Reduction at Institutions and Businesses.")

Backyard or Home Composting

At least one-quarter of municipal solid waste consists of yard debris and food scraps,[7] much of which is generated by individual households and can be successfully and inexpensively recovered at the point of generation. Through backyard or home composting programs, residents can convert organic waste into a high-quality soil amendment suitable for house plants, seedling transplants, and general garden use. At-home recovery of organic materials reduces communities' waste collection and composting costs. Seattle, for example, estimates that it saves $20 in avoided yard debris collecting and tipping fees for each ton of material composted in residents' backyards.

A number of the communities have implemented backyard composting programs. (See Table 3.1.) The most noteworthy include Seattle and King County, Washington; San Francisco, California; Naperville, Illinois; and West Linn, Oregon. Other communities, such as Monroe and Fennimore, Wisconsin, also encourage their residents to compost organic materials in their yards and/or leave grass clippings on the lawn. At-home composting programs can be grouped into three categories: "grasscycling" programs, backyard composting programs, and vermicomposting (worm bin composting).

"Grasscycling" Programs

Home waste reduction systems may be as simple as leaving grass clippings on a mowed lawn. A thin layer of grass clippings and leaves will improve the moisture retention ability of soil and act as a natural fertilizer, reducing the need for commercial fertilizers. In order to encourage participation in backyard composting and "grasscycling" or "Don't Bag It" programs, Naperville began charging residents $1.50 per bag of yard waste set out at curbside for collection. Other communities promoting grasscycling programs include Austin, Texas and Montgomery County, Maryland.

Backyard composting Programs

A number of communities promote backyard composting of organic materials by providing residents with composting bins at no charge or at subsidized rates.

The Environmental Consumer Movement

The U.S. is experiencing what has been termed an environmental or green consumer movement. In the last few years, American citizens have become increasingly aware of and concerned about environmental problems, and are expressing their willingness to change behavior—such as purchasing practices—to mitigate environmental problems. For example, a recent Gallup report indicated that 76 percent of consumers consider themselves "environmentalists." What's more, a 1990 CBS/New York Times poll reported that 74 percent of those surveyed said that the environment must be protected regardless of cost—up from 45 percent in 1981.

Manufacturers and retailers are responding to citizens' environmental concerns. The number of new products introduced with environmental claims jumped from 24 in 1985 to 160 in 1988, and then to 262 in 1989—a growth of 64 percent in one year. Procter and Gamble, for instance, has developed a 21.5-ounce milk carton-type container to hold concentrated fabric softener, replacing the 64-ounce rigid plastic bottle formerly used. Its label boasts that the new container is "better for the environment ... less packaging to throw away." Another product change in response to consumers' concerns about solid waste generation is the recent decision by the Recording Industry Association of America (representing 95 percent of the recorded music sold in the U.S.) to replace the long cardboard or plastic display boxes in which it sells compact disks with packaging no bigger than the small plastic container that holds the disk.

Sources: U.S. Environmental Protection Agency, *Assessing the Environmental Consumer Market*, Office of Policy, Planning, and Evaluation, Washington, DC, April 1991; "Greenwave," *The Boston Globe*, October 9, 1990, p. 41; and Shelia Rule, "Smaller CD Boxes Promised Amid Clamor About Waste," *The New York Times*, February 28, 1992.

Backyard composting is an integral part of King County's 1989 comprehensive Solid Waste Management Plan.[8] Since June 1989, the County has provided residents with bins at a subsidized rate ($8.75), and with technical assistance through the Master Recycler/Composter Program, the Nursery Composting Demonstration Program, and a recycling and composting information telephone line. Through a written survey, the County determined that residents receiving bins were composting at least 50 percent of their yard debris. Two-thirds of all participants reported composting at least 75 percent of their yard waste. Assuming that each household generates an average of 800 pounds of yard waste per year, the County recovered an estimated 4,220 tons of yard materials through backyard composting in the first year of the program (with 16,000 participants), and approximately 9,000 tons in its second year (with a total of 35,000 participants).[9]

In the second year of the program's operation, King County purchased and distributed 19,017 bins. The bins cost the County $20 each, about half of which was reimbursed by participating households. Assuming that the County spends no additional funds per composter after the first year, and that these 19,017 households compost yard debris for 7 years (the estimated lifespan of the bin), the County will incur a cost of only $14 per ton of yard debris composted in backyards.[10]

Vermicomposting Programs

While some communities instruct residents to compost food scraps out-of-doors, others, such as San Francisco and Seattle, also encourage residents to use worm bins. Vermicomposting can be successfully implemented indoors even in an apartment unit. This process involves the use of special worms, *Eisenia fetida* or *Lumbricus rubellus* (redworms), which thrive on food scraps. Worms can digest food quickly and produce a top-quality fertilizer, "vermicompost" in 4 months. Redworms need a dark, cool, well-aerated container, and thrive on moist bedding made from sources such as peat moss, shredded cardboard, or newspaper. If the bins are properly maintained, odor problems will not occur."

The San Francisco Recycling Programs (SFRP) developed a home composting program in 1988 with the San Francisco League of Urban Gardeners (SLUG). During the summer of 1990, SLUG began vermicomposting workshops. Participants pay $35 for instruction, a worm bin, and worms. SFRP also offers multilingual workshops in backyard composting. In 1990 the City estimated that residents were composting 4,414 tons of food scraps (7 percent of residential food scraps generated that year), and 2,164 tons of yard debris at home. (While the potential for food scrap recovery is great, very little is being done. Where communities, such as San Francisco, have encouraged food waste recovery, the impact has been very slight.)

Volume-based refuse rates can encourage backyard composting. For example, communities with successful backyard composting programs, such as West Linn, Oregon also have variable refuse rates (see Table 3.1). Even Seattle and King County can partially attribute their success with backyard composting to their yard waste collection fee structure.

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Salvage and Reuse

Reusing materials in-house at the residential or commercial level prevents these discards from entering the municipal waste stream and therefore costs a community no money for collection or processing. Community-scale reuse operations generally cost very little for collection (since most materials are dropped off) and little for processing. Operations that salvage materials before they enter the refuse collection and disposal system not only save a community collection and processing costs, but also raise revenue in some cases. Private repair and reuse operations can net considerable profit as well as provide jobs for the local community. Communities can actively promote private salvage/reuse operations through written listings and other types of publicity.

Waste Reduction at Institutions and Businesses

Disposable beverage containers and dinnerware represent a significant portion of the waste stream, especially at institutions with large food service operations. The Associated Students of UCLA, for example, operate several on-campus dining programs that encourage the washing and reuse of durable utensils and mugs. At the University of Illinois-Urbana/Champaign, and at Rutgers University in New Jersey, most meals are served on reusable tableware. Bowling Green State University in Ohio offers 5 and 10 cent rebates, respectively, for the purchase of 10- and 16-ounce beverages in reusable rather than disposable containers. Serving a campus population of 20,000, the University documented a net annual savings of more than $33,000 after accounting for the avoided disposal costs, and the cost of purchasing new glasses and washing them.

The Boston Park Plaza Hotel has implemented an "ecological travel alternative." The hotel established a 25-member employee "green team" to address solid waste reduction, water conservation, educational awareness, and reduction of hazardous waste. As a result, the hotel now has a recycling program, buys 100 percent postconsumer recycled-content paper, and has eliminated single-use tableware in its food service area. Future plans include replacing individual containers for soap, shampoo, and other toiletries with refillable dispensers.

Sources: Resource Integration Systems, Ltd., *53 Simple Things Universities and Colleges Can Do to Reduce Waste*, May 1991; and *Recycling Today*, November 1991, p. 26.

Although local solid waste managers have given considerable attention to startup of curbside recycling programs, they have given little attention to salvage and reuse as a serious waste reduction strategy. Several communities run salvage operations at public disposal sites where recyclables are either dropped off already sorted or attendants must sort through the refuse. However, most of these operations are recovering minimal amounts of the waste stream. A few programs stand out as models. These include Garbage Reincarnation in Sonoma County, California and Urban Ore in Berkeley, California.

In Sonoma County, California, Garbage Reincarnation, a local nonprofit organization, operates two "recycling/reuse/resale" depots at the landfill and transfer station, under contract with the County. Residents or businesses self-hauling refuse to these facilities may stop at the depots and drop off any salvageable items, including appliances, bicycle parts, books, tires, wine bottles, batteries, and building materials. Many items are either repaired or set out "as is" in the yard. Repair shops regularly buy appliances, television sets, lawn mowers, and bicycles. Flea market vendors buy bulky items to repair for resale. Homeowners and contractors purchase used building materials. A mattress refurbishing company buys used mattresses, which it sterilizes and recovers. Recovered paint is given away free to residents. According to Garbage Reincarnation, start-up costs for a salvage/reuse business are minimal, and on-site sales start the first day. In 1990 Sonoma County salvaged 1,483 tons of residential items, equivalent to 8 percent of all residential materials recycled and 1 percent of all residential waste generated that year.

Urban Ore is a materials salvage business, which operates two drop-off sites in Berkeley. Nearly 90 percent of the materials Urban Ore recovers and resells are dropped off by residents and local businesses; the remainder are recovered from the City's transfer station. The City of Berkeley supports this recovery operation by publicizing it and leasing Urban Ore land and buildings.

In 1990 Urban Ore recovered an estimated 5,390 tons of materials.[12] Of these, 1,123 tons were household goods, including electronics equipment, clothing, and kitchen appliances. The other 4,267 tons were building materials, including cabinets, furniture, doors, windows, and white goods. Urban Ore recovered 68 percent, or 674 tons, of the 991 tons of white goods estimated to be generated in Berkeley in 1990. It recovered approximately 25 percent, or 3,369 tons, of the 12,325 tons of wood waste generated, and approximately 50 percent, or 1,123 tons, of the reusable items discarded in Berkeley that year.

Urban Ore's 1990 gross operating and maintenance costs totaled $702,242 ($130 per ton), and its revenue totaled $729,996 ($135 per ton). It earned $27,754 in profit, employed 16 people, and paid local residents and businesses $95,000 for reusable goods. Urban Ore's capital costs total approximately $211,900 (1990 dollars), less than $15,000 per ton-per-day (TPD) recovered, far below those of many intermediate processing centers (IPC'S). (See Table 8.17)

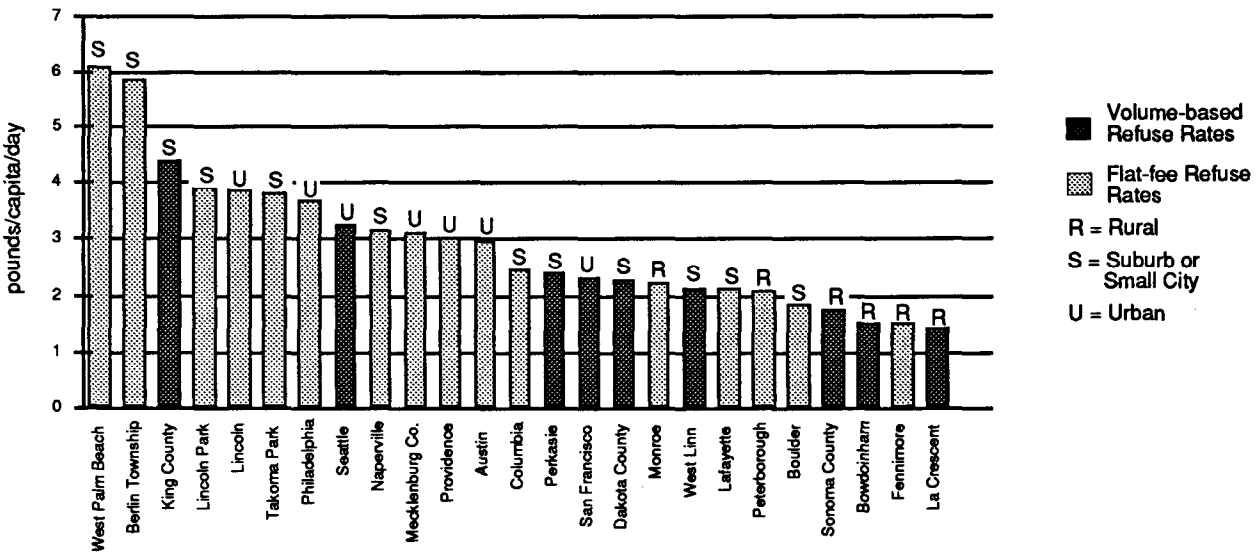
Variable Refuse Rates

Twelve of the 30 communities utilize variable refuse collection rates, charging residents higher fees for greater volumes of refuse set out. Most cities either charge residents a flat fee for refuse disposal or incorporate such costs into the municipal tax base. In contrast, variable rate **(volume- or** weight-based) systems charge residents on the basis of the amount of waste they generate, providing an immediate incentive to reduce the amount of waste set out for disposal. Chart 3.1 displays per capita *residential* waste generation levels for cities with and without volume-based rates. Communities with volume-based refuse rates, such as La Crescent, Minnesota; San Francisco, California; West Linn, Oregon; and Perkasie, Pennsylvania, are among those with the lowest per capita waste generation levels. As discussed in Chapter 2, demographic factors also affect waste generation rates.

Volum-based refuse collection sytems were first introduced in Washington State: in Olympia in 1954, in Tacoma in the 1970's, and in Seattle in 1981.[13] Since then, variable refuse rates have been implemented in 200 cities around the nation, including rural communities (such as Bowdoinham, Maine and La Crescent, Minnesota), suburbs (such as Perkasie, Pennsylvania and West Linn, Oregon), and urban areas (such as Portland, Oregon and San Francisco).[14]

Chart 3.1

Per Capita Residential Waste Generation in Communities with Volume-based and Flat Refuse Rates



There are two basic types of volume-based refuse systems. In one, residents are charged a per-bag fee and must purchase special bags or tags to place on bags. In the second, residents choose among refuse containers with varying capacities, and pay substantially more for set-out of the larger containers. See Table 3.2 for a list of volume-based programs utilized by the communities studied, including the rates charged. West Linn, with one of the steepest fee structures, has a low per capita waste generation level.

Some evidence exists that volume-based rates encourage recycling and backyard composting, and may also reduce overall per capita residential waste generation.[15] In direct contrast to the national trend of increasing generation levels, some of the study communities with volume-based refuse rates experience reductions in or stabilization of per capita waste generation.

Perkasie has a successful variable rate system. In 1988 the Borough implemented a volume-based refuse collection system, requiring residents to place refuse in special 20- or 40-pound bags sold by the Borough for $0.80 and $1.50 respectively. (In 1991 bag prices increased to $1.00 and $1.75.) This per-bag fee program replaced a flat annual fee of $120 per residence for refuse collection and disposal. In 1988 residential waste generated by the sector the Borough serves dropped 26 percent, down to 1,868 tons from an average of 2,522 tons per year between 1985 and 1987. The Borough attributes this reduction to increased public awareness of waste generation and disposal habits, resulting in improved purchasing habits; commercial customers switching to private haulers due to the bag program;[16] waste burning in backyards, fireplaces, and wood stoves;[17] and exporting of waste from the Borough or depositing

Table 3.2
Communities with Volume-based Refuse Rates

Community	System	Program Initiation	Price Paid by Residents	Administrator	Service Provider	Apartments Served
Austin, TX (a)	per can	Pilot 1991/ Citywide 1992	$6/month/30-gallon container $12/month for 90-gallon container	public	public	no
Berkeley, CA	per can	1984	$4.60/rrronth/13-gallon container $12/month/32-gallon container $24/month/64-gallon container $36/month/96-gallon container	public	public	yes
Bowdoinham, ME	per bag	1989	$1/30-gallon bag	public	private	not applicable (b)
Dakota County, MN	per bag/ per can	NA	Varied fees for 33gallon bags and 30-, 60-, and 90-gallon containers	private	private	yes
King County, WA	per can	NA	Monthly refuse/recycling rates in unincorporated areas $5.60-$8.05/20-gallon container $7.47-$11.65/32-gallon container $9.73-$17.20/two 32-gallon cans or one 60-gallon can	public	private	yes
La Crescent, MN	per bag	1989	$1.35/30-gallon bag	public	private	yes
Perkasie, PA	per bag	1988	$0.80/20-pound bag $1.50/40-pound bag (c)	public	public	yes
Portland, OR (d)	per can	NA	$12/month for one 32-gallon can $22 for set-out of two cans	private	private	yes
San Francisco, CA	per can	NA	$8.03/month/20-gallon mini-can $9.35/month/32-gallon can +$4.24 for each additional can $7.19/month for residents 65 years old or older	public	private	yes
Seattle, WA	per can	1981	$10.70/month/ 19-gallon mini-can $13.75/month/32-gallon can $22.75/month/60-gallon can $31.75/rnonth/90-gallon can	public	private	yes
Sonoma County, CA	per can	NA	$4.05 to $10 per 30- or 32-gallon can	public	private	yes
Wapakoneta, OH	per bag	1990	Beyond the $6/household monthly fee residents pay $0.70/30-gallon bag	public	public	not applicable
West Linn, OR	per can	NA	$11.55/month/one 20-gallon mini-can $13.70/month/one 32-gallon container $27.40/month/two 32-gallon containers	public	private	yes

Notes:
Administrator.= Type of organization that initiated the program, collects the funds, and in most cases, sets the volume-based refuse rates.
Although Fennimore, Wisconsin requires residents to purchase special refuse bags, because this fee is so tow (at $0.07 per bag), we do not term their program volume-based.
(a) Austin tested volume-based refuse rates in a small portion of the City in summer 1991. It plans to implement citywide volume-based rates In 1992.
(b) Residents in the Town's single multi-unit building haul their refuse to the landfill.
(c) In 1991 the Borough increased bag fees **to** $1/20-pound bag and $1.75/40-pound bag.
(d) Listed rate structure represents activities in 1990. The City has since restructured its volume-based system, and under the new program, the City will regulate the rate structure and require haulers to offer a "mini-can" at a substantially reduced rate.

of residential materials in commercial dumpsters (only four such instances were reported in 1988). The success of Perkasie's per-bag fee program is evident by comparing growth of households to growth of waste. While the number of households served by the Borough has increased 35 percent from 1987 to 1990, residential waste generated has increased by only 13 percent.

Illegal dumping or burning of refuse is a possible adverse effect of variable refuse rates. This has rarely presented an ongoing problem, however, since communities have found a variety of ways to stop illegal dumping. After experiencing increased illegal dumping during a period of rapidly rising user fee rates, Seattle in 1987 introduced a pre-paid sticker to handle additional waste generation, and hired inspectors to monitor complaints from customers and contractors.[18] In Perkasie, where there were four reports of illegal dumping in 1988, the offenders' names were reported in the local newspaper. Illegal dumping was not a problem in 1989.[19] Houston County, Minnesota, in which La Crescent is located, charges offenders $0.68 per pound of illegally dumped materials.

(See Chapter 5, "Improving Residential Recycling Rates," for discussion of how variable rates encourage recycling.)

Regulating Packaging and Other Materials

Some communities, such as Berkeley, California; Newark, New Jersey; and Portland, Oregon have passed local ordinances to ban use and/or sale of certain types of materials. In some cases, product bans lead to the substitution of one disposable material for another, and thus do not decrease the overall volume or weight of the waste stream. In other cases, however, nonrecyclable products are replaced with recyclable or reusable materials. For example, the City of Newark has worked with local retailers and cafeterias to switch from disposable to reusable utensils, plates, cups, and carry-out containers. Through product or material bans and taxes, communities can encourage manufacturers to redesign products so as to facilitate recycling and source reduction.

Conclusion

There are a variety of techniques available to control the ever-burgeoning tonnage of waste. Public education, reuse operations, and economic incentives have been implemented on a local level to encourage residents, institutions, and businesses to generate less waste. Backyard composting helps prevent organic materials from entering the waste stream, and salvage/reuse operations may indirectly help avoid waste generation. Cities are also supporting independent community-based source reduction efforts. Communities would benefit by developing ways to measure the success of source reduction programs.

Notes

[1]U.S. Environmental Protection Agency, *Characterization of Municipal Solid Waste in the United States: 1992 Update,* Office of Solid Waste, EPA/530-R-92-019, July 1992, 2-2, 4-15, 5-2.

[2]Ibid,2-29.

[3]The City of Berkeley, which has implemented a number of source reduction programs and has set a source reduction goal of 13 percent, has not conducted a waste generation study since 1989. Berkeley measures the amount of waste diverted from disposal by quantifying such things as the number of tons per week of disposable diapers not landfilled as a result of resident use of cloth diaper services. King County, Washington has estimated, through a survey, the number of tons of yard waste diverted from disposal through backyard composting.

[4]Joe Schwartz, "Shopping for a Model Community," *Garbage Magazine,* May/June, 1990, pp. 35-38.

[5]Naomi Friedman, *Certified Green: An Examination of Product Labeling and its Application to Environmental Protection* (Tufts University, February 1991), 101-103.

[6]Becky Stanfiel, "Towards a Model Community," *Model Community Update,* Central States Education Center, Champaign, Illinois, September 1991.

[7]Yard debris comprises on average 18 percent of the nation's municipal waste stream, while food waste comprises an additional 8 percent. (U.S. Environmental Protection Agency,*Characterization of Municipal Solid Waste in the United States: 1990 Update,* Office of Solid Waste, June 1990.)

[8]While the City of Seattle is located in King County, all King County data and programs listed in this report exclude the City of Seattle.

[9]These estimates credit the County with all tonnages composted in the backyards of program participants, even if such individuals had previously composted. The County determined through a survey that 62 percent of first-year participants had composted previous to the distribution of backyard composting bins. However, once the program expanded into the cities in the second year of operation, the percentage of individuals who had composted previously may have dropped. Composting rates for King County reported in this report exclude these estimated tonnages recovered through backyard composting.

[10]King County spent $682,239 on capital and operating expenses for its backyard composting program in the second year of the program's operation (April 1990 to March 1991). Most of the costs associated with backyard composting are one-time implementation expenditures, such as bin purchase and distribution, and technical assistance. The County spent $380,334 to purchase 19,017 bins (approximately $20 each) and was reimbursed $195,460 by participating households. Thus the County's net outlay for compost bins came to $184,874 in 1990-91. Program operating expenses totaled $301,905. Of this, $114,304 was spent on program operations, $91,491 on marketing, $66,625 on bin distribution, $22,370 on program administration, $4,464 on monitoring and surveys, and $2,651 on a bin brochure.

[11]Robert Kourik, "As the Worm Turns," *Garbage,* January/February 1992. See also Mary Appelhof, *Worms Eat My Garbage* (Kalamazoo, Michigan; Flower Press, 1982).

[12]This tonnage actually covers the period July 1990 to June 1991.

[13]Lisa Skumatz, "Garbage By the Pound: The Potential of Weight-based Rates," *Resource Recycling,* July 1991. Seattle, Washington and Farmington, Minnesota have tested or plan to test residential weight-based refuse collection rates.

[14]Lisa Skumatz (Synergic Resources Corporation, Seattle, Washington), personal communication, March 1992.

[15]It is difficult to determine the effect of variable refuse rates in many instances, since communities do not always track tonnages generated before and after the implementation of these rates. Also, while per capita generation rates may continue to rise after the implementation of variable rates, such rises may be less than would have otherwise occurred.

[16]Attrition of commercial customers is responsible for at least a 3.1 percent reduction in waste collected. Perkasie's residential waste includes some material collected from a small number of businesses.

[17]In 1988 the Borough did not enforce an ordinance banning backyard burning, but there were no complaints of smoke or odor.

[18]Lisa Skumatz, et al., *Variable Rates in Solid Waste: Handbook for Solid Waste Officials, Volume II*(Washington, DC NTIS Document No. EPA 910/9-90-012b, June 1990).

[19]Approximately five incidences of illegal dumping, mostly involving placement of refuse in private dumpsters, were reported in 1990.